

ARCHES NATIONAL PARK RESEARCH SUMMARY 2007

1) Study Title: The Moab Project Site Environmental Air Monitoring Program

Permit No.: ARCH-2007-SCI-0001

Principal Investigator: Joel Berwick

Purpose of Scientific Study: DOE's environmental air monitoring program will monitor local and background air quality for various radio-particulates (U-nat, Th-230, Po-210 and Ra-226), radon-222, radon gas and direct gamma radiation.

Findings/Accomplishments for 2007: Monitoring data collected during 2007 indicate that concentrations of airborne radioparticulates (Ra-226, Th-230, Po-210 and total uranium), Radon-222 and direct gamma radiation levels observed at the Arches National Park (ANP) monitoring location, are indistinguishable from background concentrations and levels. None of the 2007 data collected at this location approached recommended EPA thresholds or guidelines that are applicable to this study. According to the data collected during this reporting period (and all previous periods) for this monitoring location, the Moab UMTRA Project site (located approximately 1/2 mile south of ANP appears to have no significant impact on the air quality or public radiation exposure. The DOE is required to conduct environmental monitoring at sites where its activities could release contaminants to the public and/or to the environment. DOE will continue to monitor radioactive parameters at this location for the duration of the Moab UMTRA Project activities to ensure safe public exposure levels are maintained, and to better understand variations in seasonal air quality.

2) Study Title: Soil Survey of Arches National Park, Utah

Permit No.: ARCH-2007-SCI-0002

Principal Investigator: Victor Parslow

Purpose of Scientific Study: To provide an updated soil and ecological site inventory for Arches National Park (ARCH), that meets National Cooperative Soil Survey (NCSS) standards and park management and planning needs.

Findings/Accomplishments for 2007: 1. Soil inventory activities: Soil survey activities were conducted in Arches National Park in 2007. Traverses and transects of the landscape were conducted, and soil descriptions and plant inventory data recorded, in order to further develop the soil-plant-landscape-geology models which will be essential to the completion of the update of the Soil Survey and Ecological Site Descriptions. 26 soil/landscape observations were documented in FY 2007, and soil samples were collected from 5 of these locations. These samples have been catalogued, and are stored in the Richfield USDA Service Center.

2. Archaeological activities: In Arches National Park three sites and one isolated occurrence was recorded. Details of these resources, including locations and descriptions, can be referenced in a more complete report, Summary Report of Cultural Resources Support Provided to the Soil Surveys of Natural Bridges National Monument, Arches National Park, Canyonlands National Park and Hovenweep National Monument For the Year 2007, at the SEUG office in Moab, Utah. All cultural resources were successfully avoided. No cultural material was unearthed during the course of soil sample collection."

3) Study Title: Impacts of Climatic Change and Land Use on the Southwestern U.S.

Permit No.: ARCH-2007-SCI-0003

Principal Investigator: Jayne Belnap

Purpose of Scientific Study: (1) the causes and timing of changes in alluvial environments (rivers, streams, hillslopes), such as flooding, the cutting and filling of arroyos, and sediment discharge; (2) the role of eolian dust for soil fertility, invasion of exotic species, hydrology, and surface stability in deserts; (3) the interaction of physical and biologic processes critical for ecosystem functions; (4) how climate in the southwest has varied over decades, centuries, and millennia; (5) how future climatic variations will affect the Southwestern land surface (in terms of erosion, sand-dune activity, dust-storm frequency, flooding, landslides,); (6) how past climatic changes and environments affected prehistoric cultures.

Findings/Accomplishments for 2007: This is a long term monitoring and research project, and although data were collected, no analysis has been conducted to date.

4) Study Title: Carbon and Nitrogen Cycles in Arid Lands: The Role of Biological Soil Crusts as Influenced by Soil Surface Disturbance, Climate Change and Annual Grass Invasion

Permit No.: ARCH-2007-SCI-0004

Principal Investigator: Jayne Belnap

Purpose of Scientific Study: This project will establish how alterations in species composition by surface disturbance, invasive grasses, and/or climate change may affect N and C inputs and fluxes, in different soils under different climatic regimes.

Findings/Accomplishments for 2007: This is a long-term study that is currently being maintained and treatments are reapplied annually. No collections were made in 2007. Data were collected but not analyzed in 2007.

5) Study Title: Annual Forest Land Inventory of Utah

Permit No.: ARCH-2007-SCI-0005

Principal Investigator: Renee A. O'Brien/USFS

Purpose of Scientific Study: The Interior West Forest Inventory and Analysis program is responsible for statewide inventories in eight states. The purpose of this ongoing inventory is to gather information on condition and trends of forest resources to assess plant diversity; fuels and potential fire hazards; condition of wildlife habitats; mortality and risk associated with fire, insects, or disease; and biomass, carbon storage, forest health and other general characteristics of forest ecosystems. Under the annualized inventory system, each field plot is visited one every 10 years, with approximately 10 percent of the total plots visited each year within a state.

Findings/Accomplishments for 2007: As part of the Annual Forest Land Inventory of Utah, field crews visited one plot at Arches NP during the 2007 field season. The results of this ongoing inventory are periodically updated and made available at www.fs.fed.us/rm/ogden. The five-year report for the Utah inventory will be released in 2008. Site-specific summaries of field data are available upon request.

6) Study Title: Aquatic Macroinvertebrate Monitoring Protocol and Development (NPS I&M Program)

Permit No.: ARCH-2007-SCI-0006

Principal Investigator: Anne Brasher

Purpose of Scientific Study: The objective of the study is to develop a rigorous, well-integrated set of protocols for long-term macroinvertebrate monitoring across the Colorado Plateau. Another objective is to evaluate the utility of aquatic macroinvertebrates as reliable indicators of aquatic ecosystem conditions in dryland systems characteristic of the Colorado Plateau.

Findings/Accomplishments for 2007: Pilot studies assessing habitat characterization and evaluating benthic macroinvertebrate collection techniques were not conducted in Courthouse Wash in 2007. Reconnaissance sampling was conducted in Courthouse Wash in 2007 for possible future monitoring sites. The National Park Service Inventory and Monitoring Program of the Northern and Southern Colorado Plateau Aquatic Macroinvertebrate Monitoring Protocol and Development project is complete. A report titled "Pilot protocol implementation; report on macroinvertebrate communities and habitat characteristics in National Parks of the Colorado Plateau" is in press as a National Park Service Technical Report and will be distributed upon publication. In addition to the main report, we will be providing a brief summary of habitat characterization and macroinvertebrate data that was collected in Courthouse Wash throughout the study to the Chief Resource Manager of Arches by March 30, 2008.

7) Study Title: Delicate Arch Trailhead Restoration Project

Permit No.: ARCH-2007-SCI-0007

Principal Investigator: Tamsin McCormick

Purpose of Scientific Study: The proposed habitat enhancement project is part of a larger effort by our conservation organization toward improving wildlife habitats along critical waterways in the high deserts at the heart of the Colorado Plateau. We hope to increase public awareness about the consequences of unchecked noxious weed invasions and how members of the public can be a part of the solution, while performing hands-on restoration of a degraded riparian area in Arches National Park. We have targeted the area of the Delicate Arch trailhead, a major international tourist destination, to launch a demonstration project. The project includes rehabilitating an area of Salt Wash that has been subjected to previous tamarisk control treatments.

Findings/Accomplishments for 2007: The initial phase of the Salt Wash project is complete. The complete removal of all tamarisk stumps from the bank on the West side of the creek. Nearly 50 students participated in the removal projects. Groups varied in age from middle school to college seniors. Our exit evaluations from students and teachers were positive as this hands on project along with instruction provided a clear understanding of the tamarisk problem along waterways and the challenges associated with control and revegetation. Our project completed a huge goal of removal and prep of the area for revegetation but has not moved into the revegetation phase. The area is ready for transplanting and seeding this coming spring of 2008.

8) Study Title: Intermountain West Native Plant Pollination Project

Permit No.: ARCH-2007-SCI-0008

Principal Investigator: James Cane

Purpose of Scientific Study: The primary purpose of our data collection, within the parks, is to investigate and quantify the pollinators that are associated with *Sphaeralcea* spp. This information will be used to identify bees that are important pollinators of these species and whether the pollinators are potential candidates for management. We hope to develop sustainably managed pollinators that can be used on farms which will grow native *Sphaeralcea* spp. for BLM restoration purposes.

Findings/Accomplishments for 2007: To identify species of bees that currently pollinates *Sphaeralcea* spp. we collected and characterized a small sample of associated pollinator fauna at one location within Arches National Park. A standardized sampling survey was conducted on a single stand of *S. parviflora*.

Briefly, thirty plants within a stand were counted and systematically sampled collecting all bees visiting a single plant. When bees were not present on a plant, the plant was counted in the total sample to estimate abundance. Four bees were collected on 20 plants (38.46.330lat / 109.38.171 long) within Salt Valley. One plant voucher specimen was taken at this location and each has been verified as *S. parviflora*. Bee samples have been mounted, labeled, and entered into a specimen-level database at the United States National Pollinating Insect Collection at the USDA-ARS Pollination Insect Biology, Management and Systematics Laboratory facilities in Logan UT. Identifications to genera are completed and provided below.

Accession-number ID-Number Family Genera Nesting

ARCH-328 ARCH-3906 Megachilidae Megachile Solitary cavity

ARCH-328 ARCH-3907 Megachilidae Megachile Solitary cavity

ARCH-328 ARCH-3908 Megachilidae Megachile Solitary cavity

ARCH-328 ARCH-3909 Megachilidae Megachile Solitary cavity

9) Study Title: Population fragmentation, habitat, and conservation genetics of amphibians in the Glen Canyon / Canyonlands region

Permit No.: ARCH-2007-SCI-0009

Principal Investigator: Charles Drost

Purpose of Scientific Study: Loss of connectivity among habitat patches and resulting fragmentation of natural populations are important concerns for long-term preservation of natural populations. Studies of some anuran amphibians have demonstrated loss of connectivity within extensive populations and have noted the potential contributing role of such fragmentation to amphibian declines. A variety of causes have been implicated in fragmentation of amphibian habitat, ranging from outright habitat destruction to introduction of non-native species. Isolation of subpopulations within habitat fragments, and gradual loss of these subpopulations over time, may be an important reason for regional declines (e.g. in *Rana muscosa*, studied by Bradford et al.). In the southwestern United States, there is considerable natural fragmentation of amphibian populations by broad stretches of hot, dry, inhospitable habitat separating seasonal and permanent wetlands. For this reason, the riparian areas along rivers and streams are vital habitat for many amphibians in this arid country, and provide extensive corridors linking populations. Over the last 150 years, however, there has been considerable degradation and loss of such habitats, with consequent declines of species that depend on them. Some studies have examined direct effects of such habitat loss and degradation, but few have considered secondary effects such as isolation of tributary streams, side canyons, and headwater springs, and the resulting population fragmentation this may cause. Because of limited dispersal abilities and susceptibility to desiccation in arid habitats away from water, amphibians appear to be particularly vulnerable to this kind of population fragmentation. The Colorado River and its major tributaries once provided more or less continuous habitat for northern leopard frogs (*Rana pipiens*) and other amphibians. Over the last 40 years, leopard frogs have experienced marked declines throughout the Southwest (Clarkson and Rorabaugh 1989, Corn and Fogleman 1984, Sredl 1998). Northern leopard frogs are currently listed as species of conservation concern by a variety of state and Federal agencies, including the U.S. Forest Service (Sensitive, Regions 2 and 3), the Arizona Game and Fish Department (Species of Special Concern), the State of Colorado (Special Concern Species), and the Navajo Nation (Threatened). We have conducted field surveys over the last three years in Grand Canyon and Glen Canyon that underscore the decline of this species in the Upper Colorado River region. Historical surveys found leopard frogs to be widespread both along the main course of the Colorado River, and in perennial side canyons of Glen Canyon (Eaton 1935, Woodbury 1958, Drost and Sogge 1995). With

the completion of major reservoir projects such as Glen Canyon Dam / Lake Powell, however, leopard frog populations along the river have nearly all disappeared (Tomko 1975, Miller et al. 1982, Drost and Sogge 1995, Drost 2005). Northern leopard frog may now be extirpated from the Grand Canyon reach of the river. In Glen Canyon, populations of the species have become much reduced and restricted to a few scattered side canyon sites. Recent studies (Drost 2005, J. Spence, Glen Canyon National Recreation Area, pers. comm.) indicate that some of these side canyon populations are now disappearing as well. Inventory and genetic data from Arches National Park will add to the regional picture of leopard frog status and population trends in this region, in addition to providing specific data for National Park Service protection and management of the species in this area. Our working hypothesis is that populations that are buffered from large-scale habitat changes (such as Arches) should retain healthy leopard frog populations.

Findings/Accomplishments for 2007: This study is focused primarily on the population distribution and status of northern leopard frogs in the Glen Canyon and Canyonlands area, but we have expanded our surveys to search for this species in nearby areas. The distribution of leopard frogs throughout the area from northern Arizona through the Arches area is much reduced and fragmented. The nearest location to Arches where we have documented leopard frogs to date is from wetlands along the Colorado River at Moab. From discussions with NPS staff, we believe that leopard frogs may be found in either Courthouse Wash or Salt Wash, and we will search those areas in the coming spring and summer.

10) Study Title:

Permit No.: ARCH-2007-SCI-0010

Principal Investigator: Michelle DePrenger-Levin

Purpose of Scientific Study: The goal of this study is to create a best management practices handbook for revegetation of riparian lands, with special emphasis addressing the challenges posed in the canyon-lands of the upper Colorado Basin.

Findings/Accomplishments for 2007: No activity was conducted this report year.

11) Study Title: Acoustic Monitoring in Arches National Park

Permit No.: ARCH-2007-SCI-0011

Principal Investigator: Skip Ambrose

Purpose of Scientific Study: The primary objective of this project is to provide basic acoustic data necessary for preparation of air tour management plans for ARCH. A secondary objective is to collect acoustic data that will be useful in preparing a soundscape management plan. Specifically, these data include:
1. Natural sound levels in the primary habitats/acoustic zones in ARCH during all seasons of the year; and 2. The influence of aircraft and other man-made noise on natural sound levels.

Findings/Accomplishments for 2007: In 2007, acoustic data were collected at one location in ARCH (near the north end of Salt Valley Road) in order to complete data collection for the ARCH acoustic study.